Lightweight Ultrahigh Temperature CMC-Lined C/C Combustion Chambers, Phase II

Completed Technology Project (2006 - 2008)

Project Introduction

NASA and DoD are seeking high-performance, lightweight liquid rocket combustion chambers with future performance goals that cannot be achieved using state-of-the-art actively cooled metallic liners, silicided C103, or even carbon fiber-reinforced silicon carbide (C/SiC) ceramic matrix composites (CMC). Ultramet has previously developed and successfully demonstrated carbon fiber-reinforced zirconium carbide (C/ZrC) and zirconium-silicon carbide (C/Zr-Si-C) matrix CMCs for use in liquid propellant applications up to 4200

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F. In Phase I, Ultramet demonstrated the feasibility of combining the light weight of C/C with the oxidation resistance of ZrC and Zr-Si-C matrix composites in a unique system composed of a C/C primary structure with an integral CMC liner. The system effectively bridges the gap in weight and performance between coated C/C and bulk CMCs. Rapid fabrication was demonstrated through an innovative variant of Ultramet's melt infiltration refractory composite processing technology. In Phase II, Ultramet will team with ATK-GASL for process optimization, component fabrication, and comprehensive testing of lightweight, high-strength, elevated temperature oxidation-resistant liquid rocket combustion chambers. The fully developed system will have strength that is comparable to that of C/C, low density comparable to that of C/SiC, and ultrahigh temperature (>4000

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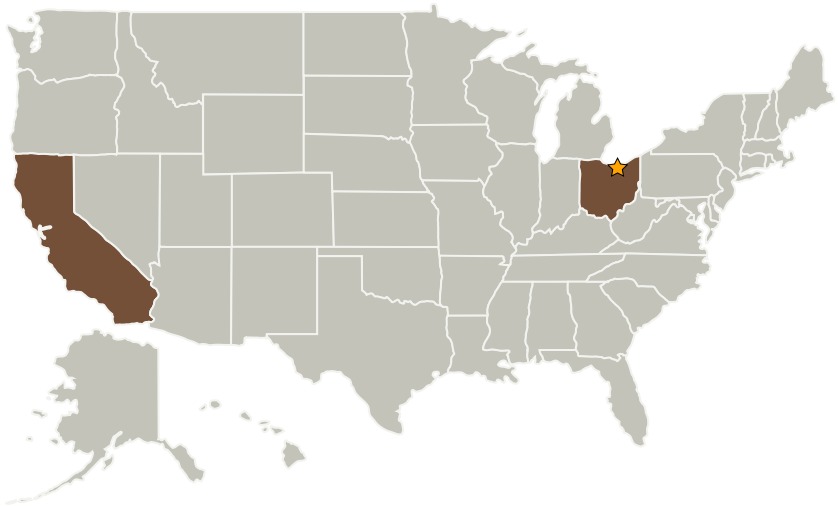
F) oxidation stability.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Ultramet	Supporting Organization	Industry	Pacoima, California

Primary U.S. Work Locations	
California	Ohio

Project Transitions

December 2006: Project Start

December 2008: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX02 Flight Computing and Avionics
  - TX02.2 Avionics Systems and Subsystems
    - TX02.2.1 Spacecraft Command and Data Handling Systems (C&DH)